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THE EFFECTS OF CRITICAL THINKING SKILLS TRAINING ON STUDENT
PERFORMANCE IN AN EDUCATIONAL PSYCHOLOGY CLASS

by

Eric J. Gee

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1995

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ABSTRACT

The Effects of Critical Thinking Skills Training on Student
Performance in an Educational Psychology Class

by

Eric J. Gee, Master of Science

Utah State University, 1995

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Department: Psychology

Critical thinking skills have become an important part of current educational practices. However, there is little empirical evidence comparing the effectiveness of the programs teaching these skills. In addition, there are questions as to whether the skills should be taught within the class content or separate from the class content.

This study assigned students attending labs as part of an educational psychology class to two experimental conditions (content-based and content-free) and a control condition. Measures were scores on lab papers and test scores for the class. In addition, an attitude survey was used to assess student attitudes to each condition, and the overall quality of the labs was assessed. An analysis of variance was performed on the data. Results indicated little difference between experimental and control conditions.

(112 pages)

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Eric J. Gee

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INTRODUCTION

For the past three decades, the educational system of the United States has been declared woefully inadequate to meet the needs of its children (Applebee, Longer, & Mullis, 1991). Many educational programs are experiencing difficulty covering all the information now available about a particular topic effectively and efficiently (McTighe & Schollenberger, 1991). More than ever before, editorials, magazine articles, and research have focused on what is right and what is wrong with current teaching methods, curriculum development, and class structures.

While students are performing better than ever in the basic disciplines (reading, writing, math), there are deficiencies of a different nature in areas such as problem-solving and analysis (McTighe & Schollenberger, 1991). Several authorities believe that rote memorization of certain facts and figures with required reproduction of those facts and figures on tests is not enough (McTighe & Schollenberger, 1991). If classroom information is not taught effectively, it will never be learned or understood by the student. If that same information is not demonstrated by the student soon enough, it is forgotten and of no use to anyone (Sternberg & Martin, 1988). If effective learning is to take place, there must be a change in the manner in which the material is presented and the way in which the students think about it (Beyer, 1985; Ferguson, 1986; Jones, Palinscar, Ogle, & Carr, 1987).

Hence the rise of critical-thinking skills, problem-solving skills, decision-making skills, and many other "skills" whose definitions are as varied as their names (Adams, 1989; Schrag, 1989). Several programs teaching these skills have been developed, resulting in a cornucopia of activities, competencies, and thinking goals.

Some examples of these types of programs are: Structure of Intellect (Meeker, 1991), Instrumental Enrichment (Link, 1991a), Odyssey (Wright, 1991), and Philosophy for Children (Lipman, 1991).

Each of these programs, known generically as critical-thinking programs, provides techniques and ideas for encouraging students to use information learned in class in nonclassroom situations as well as getting beyond a cursory examination and ritual reproduction of that information (McTighe & Schollenberger, 1991). However, little is known about their effectiveness.

There are two basic problems that make the determination of these thinking programs' effectiveness difficult:

1. There is a lack of verifiable empirical evidence for many critical thinking programs and no evidence of their comparative effectiveness.
2. There is disagreement over whether such programs should be content-based or content-free.

As use of these programs becomes more and more extensive, there is a need to address these issues. This study was conducted to provide an external evaluation of a particular thinking program and to ascertain the effectiveness of that program. In addition, it investigates the differences between teaching those skills in isolation or incorporating them into the subject matter.

REVIEW OF LITERATURE

Introduction

The literature on critical thinking will be discussed in the context of the two problems mentioned in the previous section.

1. There is a lack of verifiable empirical evidence for many critical thinking programs and no evidence of their comparative effectiveness (Brandt, 1988a; Chambers, 1988; Nickerson, 1984, 1988; Sholseth & Watanabe, 1991).

Most of the research that has been done to substantiate the effectiveness of programs has primarily focused on increases in standardized test scores (Adams, 1989; Nickerson, 1988; Worsham & Austin, 1983). The results of these studies have not been conclusive.

With some notable exceptions (see Savell, Twohig, & Rachford, 1986; Chissom & McClean, 1993), most of the evidence for each program's effectiveness was collected by the program designer with very little in the way of external evaluation being conducted. In addition, few follow-up studies have been carried out.

Some assert that teachers' and students' opinions are the best measure for the effectiveness of programs (Brandt, 1988b). Even so, little empirical evidence is available to support this assertion beyond all-encompassing statements provided, generally, by the program designer. In addition, the enthusiasm a teacher feels for a program may be a result of the introduction of a new program and have little to do with the program itself--a type of Hawthorne effect.

2. There is disagreement over whether such programs should be content-based or content-free.

Most programs can be divided into two categories: content-based or content-free. Content-based critical-thinking programs incorporate the teaching of critical thinking skills within the class subject matter. In contrast, content-free programs hold that the skills themselves should be the content of the class. For some theorists, this distinction is an important aspect of their theoretical base (DeBono, 1983); others consider the distinction unimportant or ignore it altogether.

Content-based adherents have stated that context cannot be ignored while teaching skills. For example, math and chemistry skills differ greatly from reading and art skills (Chambers, 1988), thus efforts to transfer skills without some content base tend to be ineffectual (Adams, 1991). Furthermore, these researchers have suggested that if a skill is taught with the subject matter, it will greatly enhance learning of that subject matter (Beyer, 1983).

Content-free advocates have stated that thinking should be taught directly, as a skill, much in the same way students are taught how to diagram a sentence or compute using the quadratic equation (DeBono, 1991). These theorists have suggested that teaching content along with the thinking skill creates interference between the learning of both and will result in an ineffective use of that skill (DeBono, 1983).

Some programs emphasize gains in general knowledge rather than gains in specific content areas (Pogrow, 1991). Others focus on the process of learning,

rather than any particular skills (Link, 1991a). Reasoning skills are often emphasized and considered separately from particular content areas (Lipman, 1984).

As mentioned before, little research has been done to ascertain the differential benefits of a content-based versus a content-free program. A review of the literature reveals several inadequacies in the theoretical base of critical-thinking programs. First, there is no concise definition of critical thinking. Due to the lack of a clear definition of critical thinking, critical-thinking skills taught in various programs vary widely in content and purpose. In addition, there is controversy as to whether these skills should be presented with the regular content of a course or should be taught by themselves. Finally, there is lack of research in several critical-thinking programs. With few exceptions, supporting data for critical-thinking programs are sparse and generally provided by the creators of the program. External evaluations of the programs are rarely done (Nickerson, 1984, 1988; Brandt, 1988a).

This review will delineate in more detail both the empirical evidence of the effectiveness of critical thinking and the distinction between content-free and content-based programs. However, before it is possible to investigate the effectiveness of critical-thinking programs, an understanding of what critical thinking means is necessary. Therefore, the review will begin with a discussion of definitions of critical thinking.

Defining Critical Thinking

There is a plethora of definitions that have been used with respect to critical thinking. Critical thinking has been defined as assessment of the value of claims and

arguments (Beyer, 1985), a collection of specific skills (Nickerson, 1988), use of certain mental abilities (Nickerson, 1988), learning strategies based on the specific circumstances the learner finds himself or herself in (Paul, 1984), observation, categorization, deductive or inductive logic, decision making, problem solving, creativity (Hernstein, Nickerson, DeSanchez, & Swets, 1986), identification of errors (DeBono, 1984), solving problems with original solutions (Hobbs & Schlicter, 1991), evaluation of information (Beyer, 1985), control over certain cognitive operations and attitudes related to learning (Barrell, 1991), logical reasoning (Brabeck, 1983), and information-processing strategies used to aid learning of specific subject matter (Marzano, 1986).

Obviously, the definition of critical thinking varies with the individual discussing it. An unspoken assumption is that these are processes in which the student does not normally engage. They are similar in that they define thinking as an active process, something that is consciously performed. Schrag (1989) described several characteristics of this active process of thinking. He described critical thinking as: nonalgorithmic, complex, yields multiple solutions, involves judgment, involves applying several criteria, involves uncertainty, requires self-regulation, involves imposing meaning, and is effortful.

However, is critical thinking simply more active or effortful than lower-level thinking? Schrag (1989) brings up some excellent points. He stated that just trying to remember a phone number is effortful and active. Yet, such an activity would not

be considered critical thinking. What about driving a car? It involves all of the processes, yet, is it critical thinking?

Beyer (1985) claimed that several processes normally associated with higher-order thinking skills are not part of the critical-thinking concept. For example, problem solving, decision making, and logical reasoning are not critical-thinking skills. Yet, many program developers call their programs critical-thinking programs and include these particular skills (Young, et. al., 1991; Isaksen & Treffinger, 1991; Marzano, 1991; Nardi & Wells, 1991).

Another skill included in many critical-thinking programs is creative thinking. The notion of creativity as it relates to critical thinking is another fly in the ointment of critical-thinking definitions. Creative thinking can be said to differ from critical thinking in that creative thinking produces something novel and usable while critical thinking is no more than tearing something apart that already exists (Perkins, 1984). One critical-thinking program is based on the production of varied and unusual solutions to a problem, a statement which is often used to describe divergent thinking, a form of creative thought (Barbieri, 1988).

One assumption underlying all definitions is that thinking is the application of a set of skills and that improving thinking is a matter of teaching those skills (Adams, 1989). The skills taught by a particular program will be directly related to the beliefs held by the creators of that program. Without a unified definition, the skills considered important for critical thinking become as varied and widely different as the

definitions themselves (Nickerson, 1984). In fact, even classification of skills can vary widely.

The definition of critical thinking that will be used with respect to this study is an adaptation of Marzano's (1986) definition. Critical-thinking skills will be defined as a set of skills that aid in the learning of domain-specific knowledge. This definition was viewed to be most in line with the goals of the study.

Categories and Classification of Thinking Skills

Paul (1984) described two classes of critical-thinking skills: micrological skills and macrological skills. Micrological skills are described as specific skills needed for a particular task. Macrological skills are described as skills needed for general problem solving. Adams (1989) also used this particular dichotomy to categorize critical thinking programs. She described critical-thinking programs such as CoRT, Philosophy for Children, and Productive Thinking programs as macrological and Instrumental Enrichment, Intuitive Math, and Think programs as micrological.

A sampling of specific skills from different programs includes: classifying (Baker, 1991), Socratic dialogue (Ferguson, 1986), observation, induction, deduction (DeNitto & Strickland, 1987), framing skills (Fritz & Weaver, 1986), cause-and-effect inference (Sholseth & Watanabe, 1991), pattern recognition (Fredericksen, 1984), reflective judgment (Brabeck, 1983), concept attainment (Marzano, 1986), verbal reasoning (DeSanchez, 1991), and productive thinking (Hobbs & Schlicter, 1991).

Close examination reveals that some of these skills are quite similar with the specific labels given to the skills being the only difference between them (Adams,

1989). For example, it is likely that pattern recognition has much in common with classifying and that cause-and-effect inference is similar to induction and deduction.

However, skills may vary radically from program to program (Nickerson, 1984). For example, Tactics for Thinking focuses on several individual techniques, such as attention control, pattern recognition, and proceduralizing for improving thinking (Marzano, 1991). Philosophy for Children attempts to improve children's reasoning ability through discussions about a novel called Harry Stottlemeier's Discovery (Brandt, 1988b).

Analysis of the individual skills used by a program became important in deciding which program to use for the study. Though all programs are composed of certain skills, some skills are important to the performance of certain tasks. Other skills may have no effect on performance of a particular task. In addition, a program may have a positive effect on one aspect of student performance while having a negative effect on another due to the particular skills emphasized and excluded by the program (Nickerson, 1988).

Categories of Critical-Thinking Programs

Nickerson's categories. Nickerson (1984) has claimed that programs can be broken down into five categories: cognitive process, heuristics-oriented, formal thinking development, language and symbol manipulation, and thinking as subject matter.

The assumption in the first category is that thinking ability depends on the use of certain processes, and exercising these processes will increase critical thinking.

Nickerson classified programs such as Feuerstein's Instrumental Enrichment and Meeker's Structure Of Intellect as programs fitting into this category.

Heuristics refer to problem-solving strategies. Covington's Productive Thinking and DeBono's Cognitive Research Trust are two critical-thinking programs emphasizing problem solving.

His third category refers to programs that focus on bringing students into Piaget's formal operations stage. Skills emphasized within these programs were inquiry exploration, hypothesis testing, and hypothesis formation. ADAPT, a critical thinking skills program for college students, can be placed into this category.

Language and symbol manipulation programs are based on the assumption that if reading and writing skills improve, thinking skills will also improve. Writing is especially valuable since it produces a product that can be easily evaluated. The Little Red Writing Book, Confront Construct Complete, and LOGO (a computer program) are examples of this type of program.

Philosophy For Children is probably the best example of a program where thinking is the subject matter. It focuses upon metacognitive skills such as knowledge acquisition.

Content-based versus content-free programs. Adams (1989) has broken program approaches into two categories: those that build their activities around "real-life" problems and those that focus on more abstract skills, with most programs focusing on development of abstract skills. An extension of this breakdown is the content-free category of programs and the content-based category of programs.

Content-free programs might be judged to focus on the abstract skill while the content-based programs tend to use the skills to solve classroom problems.

Content-free programs operate under the assumption that the focus of the program should be on the processes of learning rather than the particular content (Link, 1991b). Specific thinking techniques should be taught and retaught until they are habits (DeBono, 1983). DeBono, probably the most vociferous of the proponents of content-free thinking instruction, explained that if both content and critical-thinking skills are being taught, the skills are taught so that the students grasp a particular content concept. Attention is focused on the content and knowledge of how to use the technique is lost. In a content-free class, attention remains on the thinking skills.

Adams (1989, 1991) explained that schemas are used to organize the world; and when thinking about a particular schema, the mind rarely wanders into other schemas preventing confusion. If thinking skills are developed only in relation to a particular content, then they will only be accessed when thinking about that content. The skills will not be transferrable to different situations.

Content-based program theorists believe that the skills should not be taught in isolation (Brandt, 1988a). The context in which the skills are taught must be considered if the knowledge is to be useful (Preisseisen, 1988).

Beyer (1983) has suggested that while skills instruction improves learning of the subject matter, accomplishing a content-related goal enhances the learning of the skills. Skills should be taught explicitly and then integrated with the subject matter.

Isolating the teaching of skills makes it difficult to transfer that information to real situations (Berman, 1991).

However, little empirical evidence has been provided to substantiate such claims. Does the particular orientation of the program make any difference? Should some programs be content-based while others are better in a content-free environment? What is the nature of the relationship between the skills being taught and the context in which they are learned?

To make good distinctions among programs and skills, more research is needed into the nature of critical thinking skills as well as the programs that use them. From such research, a more concrete definition of critical thinking can be determined.

Research and Evaluation of Critical-Thinking Programs

Generally, data on a program are gathered and processed by the program creator. Many critical thinking programs receive government funding and as a result must provide empirical evidence of the effectiveness of the particular program. So to say there is no research in the area of critical thinking is not strictly true. Unfortunately, much of this original research is not readily available. Accessibility of information is an important factor in determining a program's empirical support; thus, this review will focus on studies available in peer-reviewed journals only.

Feuerstein's Instrumental Enrichment (IE) program was a program initially developed in Israel that is now being used in several countries including the United States. It has been studied several times in many different environments. Savell et al.

(1986) reviewed several of the IE studies to determine the nature of IE effects and the amount of IE that appears to be needed for these effects to occur. Most of the studies used the experimental-control group design using pretest and posttest to measure program effects. In most studies, subjects were classified as disadvantaged either intellectually or physically.

In his original study, Feuerstein implemented his program over a space of 2 years. He used a pretest-posttest design utilizing several different measures and found statistically significant differences between those students who had received IE and those who had not. There were several replication studies conducted in Venezuela and the United States that supported Feuerstein's conclusions.

Savell et al. (1986) concluded that there were some actual group differences in a number of different populations. They also reported that effects were most commonly found where nonverbal measures of intelligence were used. In comparing those studies where the largest effects were produced, they found three common factors: instructors had gone through several weeks of training, students had been exposed to the program for several hours a week over a 2-year period, and IE had been taught in conjunction with other subject matter of importance and interest.

Limitations of the studies in some cases were lack of random assignment, no pretest (in some studies), absence of data on experimental attrition, and few studies using college-aged or adult subjects. Lack of random assignment leads to doubts about the similarity of control and experimental groups. Without random assignment, there is no way to determine if differences between group scores are due to the program

used or some other unknown factor. Lack of a pretest does not allow judgments about the initial state of the group or groups being studied. A posttest only cannot lead to a definite conclusion about the program's effectiveness. Lack of data on experimental attrition can be very important, especially if the subjects who dropped out of the study possess similar characteristics. Finally, the restriction of the subject pool studied limits the generalizability of the results of these studies.

Interestingly, all of the studies considered by Savell used standardized tests as their measuring instrument. None used the grades or scores given by teachers to measure effects. Neither was there any systematic measurement of teacher and students' attitudes towards the program. Teacher evaluations can often measure an aspect of performance that standardized tests cannot, such as student enthusiasm, rapidity of comprehension, and long-range effects (Cangelosi, 1990).

Another limitation to the findings is that the results of these studies cannot be generalized. The majority of these studies focused on the effects the program had on disadvantaged or handicapped students. An ERIC search of the Feuerstein Instrumental Enrichment program revealed 31 studies conducted in the past 8 years of which 27 used handicapped, remedial, hearing-impaired, or learning-disabled students as subjects. It is not known whether the same effects would be found with students from a regular classroom.

Other critical thinking programs have also been assessed to some extent. In one investigation, the effectiveness of a critical thinking program called THINK (Worsham & Austin, 1983) was assessed. Eighty-seven high-school seniors from the

Baltimore school system were introduced to the critical thinking language arts program. Two of their five English periods were spent in activities related to this program. This program continued for three semesters. Fifty-two seniors attending regular English classes served as the control group. Pretest measures were scores on the CAT (California Achievement Test) administered during the junior year. The posttest measures were scores on the SAT (Scholastic Aptitude Test). The experimental group showed a mean increase of 42 points on the total verbal score, 15 percentiles above the control group. Worsham and Austin (1983) concluded that the cognitive training provided by THINK facilitated the increase in scores.

There are several problems, however, with drawing this conclusion. First, though the study reported establishing the equivalence of the groups on the California Achievement Test, no other information about the class composition was provided, for example, past grades, ratio of males to females, ratio of races, socioeconomic status, and so forth. Second, it is unclear as to whether the same teacher taught all the classes. If not, the nature and skill of the teacher might be a confounding factor. In general, the interaction between program and teacher is an issue often ignored in the literature. Third, the control group did not control for change in scores due to alteration of the usual classroom routine. They were experiencing class as normal, while the other class was experiencing something new and different. Increases may have nothing to do with the program itself, but to the break in the monotony of regular classroom instruction. This change may have stimulated interest. Fourth, the pretest scores were CAT scores and posttest scores SAT scores. It is unlikely that comparison

between two different tests will result in accurate results. Finally, long-term effects of the program cannot be determined since no follow-up information is provided (another weakness of critical-thinking research in general).

One program that does seem to possess a broad empirical base is Talents Unlimited (TU). In a review of literature conducted by Chissom and McClean (1993), it was found that a majority of studies looking at TU had significant results. However, one study available in the literature does not have such positive findings.

Gordon and Shaver (1985) investigated the effects of the TU program on student's productive and creative-thinking scores. Subjects were students from six elementary schools. A nonequivalent control group design was used. Subjects were in classrooms and could not be randomly assigned to the two different conditions. Experimental groups used activities and ideas from TU for 5 months. Control groups received regular instruction. The two assessment instruments used were the Multiple Talent Test (MTT) and the Torrance Test of Creative Thinking (TTCT). Students were pretested and posttested with both.

With the exception of two subtests, the students receiving TU did better than control students on all subtests of the MTT and the TTCT. All results were significant at the .05 level. Means for the productive thinking subtest of the MTT were 91.08 for the experimental group and 84.15 for the control group, resulting in an effect size of +.21. The fluency subtest on the TTCT reported an effect size of +.27, with 24.35 being the experimental group mean and a control group mean of 22. Effect sizes on all the other tests were similar, except for the MTT forecasting subtest, where the

effect size was $+0.74$, and the TTCT elaboration subtest where the effect size was -0.63 . It was the control group mean that was higher on this particular test.

Gordon and Shaver (1985) reported that the results, though statistically significant, were not particularly "striking." They suggested that the results might be due more to teacher enthusiasm rather than effectiveness of TU.

In a personal communication from D.E. Hobbs, dated April 13, 1995, three serious flaws in this study were discussed. First, the individuals involved in the training of the teachers in TU techniques were not certified to do so. The certification process is lengthy and rigorous. Second, the length of the training was 5 hours. Certification in TU requires a minimum of 12 hours of training. Third, the length of the intervention was 5 months long. Schlicter and Palmer (1993) have shown that students must have at least 2 years of instruction in Talents Unlimited in order to demonstrate the greatest gains.

Shaver (1983) has argued that treatment fidelity in studies is an extremely important aspect. By treatment fidelity, he means how closely the intervention used conforms to prespecified standards. By the standards of TU, the Gordon and Shaver (1985) study does not conform. The results reported must be viewed as lacking in validity.

Though TU has a great deal of support in other research studies, its skills were seen to address a broad area of cognitive processes. Many of its skills, such as productive thinking, are exploring creative as well as critical thinking processes. It

may be more difficult to tease out the differences between critical and creative thinking within such a program.

Hernstein et al. (1986) developed a thinking skills course in Venezuela, put it into use, and attempted to evaluate the results. The course consisted of six lesson series addressing six different thinking topics. Subjects were students from 24 seventh-grade classes in the city of Barquisemeto.

The evaluation was based on objective multiple-choice tests given before, during, and after the course. These were the Otis-Lennon School Ability Test (OLSAT), the Cattell Culture Fair Intelligence Test (CATTELL), and items from the General Abilities Test (GAT). In addition, Target Abilities Tests (TAT) designed by the creators of the course were used for evaluation. Finally, an Oral Reasoning test was used.

There were some significant gains on all tests with the gains most significant on those tests similar in content to the course itself. The experimental mean for the OLSAT was 27.0, which increased to 39.9. In contrast, the control group had a pretest mean of 26.2 and a posttest mean of 34.9. On the CATTELL, the experimental mean score was 49.9 on the pretest and 57.6 on the posttest. The control group had a pretest score of 47.8 and a posttest score of 54.2. Means for the GAT were 123.1 and 147.9 for the experimental group and 121.7 and 136.5 for the control group. Scores followed the same pattern for the TAT: increases in both scores with the largest increase occurring for the experimental group mean. For the Oral Reasoning Test, experimental students received higher scores as well.

Hernstein et al. (1986) mentions limitations to the experiment. They were unable to identify which aspects of the course were most helpful. There was a possibility of a Hawthorne effect. They suggested that gains made by the experimental group may have been a function of creating a new learning atmosphere in which teachers and students were more motivated. The teachers of the course were from the same district as the children themselves. However, they were chosen because of their availability and interest in the project. The observed effects could have been a result of an enriched classroom environment, a better teacher, or a combination of both. In fact, it is possible that the program had little to do with the test score increases. It is difficult to draw any solid conclusions from the information provided by the study. The authors themselves expressed some doubt as to the efficacy of the program.

There are some indications that critical-thinking programs may be effective. However, limitations of the studies researching different programs prevent making general conclusions about the programs' effects. First, most studies look at the effects of programs on disadvantaged or handicapped children. There are few studies done in regular classrooms and even fewer done with college-aged students.

Second, the vast majority of studies use standardized tests as measures. Although important measures, they are not designed to measure the thinking skills or content being taught. Few classroom measures were used.

Third, most studies use a control group design with the experimental group receiving the critical thinking skills instruction and the control group receiving regular

instruction. More importantly, no comparison is made between content-free and content-based critical-thinking programs.

Summary

For the purposes of this study, critical thinking can be thought of as that set of skills that will aid students in the learning of specific content information and the reproducing of that information on later assignments. The category of programs most likely to influence the effectiveness of a critical-thinking program is the content-based/content-free dichotomy.

This review of the literature indicates a need to extend the research on critical-thinking skills and their related programs. Research needs to be more rigorous in its design and to use a variety of measurement methods with different populations. Studies should be conducted by external evaluators. A good distinction between content-based and content-free programs needs to be delineated through comparison studies of such programs.

THE STUDY

Purpose of the Study

The purpose of this study was to investigate the effects of critical-thinking skills on the performance of college-aged students and to compare the content-based and content-free orientations. Three questions were asked at the onset of this study.

1. Do critical thinking skills increase the quality of students' performance on tests and assignments?
2. If so, should these skills be content-based or content-free?
3. What effects do such skills have on students' attitudes towards the class?

Method

Design. The study employed an experimental-control design with two experimental conditions. In one experimental condition, critical-thinking skills were incorporated into the class content. In the other, the critical-thinking skills were taught separately from the class content. Treatment effects were determined by comparing treatment group results to a control group using pretest-posttest and follow-up procedures.

The experiment was conducted in three phases: pretreatment phase, treatment phase, and posttreatment phase (see Appendix A). This study differed from previous studies in that instead of using standardized tests to measure improvements, normal classroom measures were used. Dependent variables were scores on lab papers, scores from an attitude survey, and scores on three objective-referenced tests.

Subjects. Subjects for the experiment were students in an educational psychology class. The class consisted mainly of education and psychology majors, most of whom were in their junior or senior year. There were 139 students in the class, 93 of which qualified to remain in the study. The final group consisted of 80 females and 13 males.

Conditions. A requirement for the class was attendance at a 50-minute lab period once a week. This period was used to expand upon themes taught during regular class instruction. There were six separate lab groups for the class. Each lab group met once a week for 9 weeks (clustered into 3-week blocks). Three of the lab groups were composed of elementary and early childhood education majors. The other three lab groups were composed of psychology and secondary education majors. Two lab groups, a secondary and an elementary group, were randomly assigned to each condition.

Normal lab activities consisted of discussing assigned articles about education and psychology-related issues and participating in mini-experiments. Each 3-week block centered around a particular topic. The first 3-week block looked at developmental issues. The second block centered on learning theories, and the last block dealt with classroom-related topics such as classroom management and testing.

Labs in the content-based condition were taught critical-thinking skills by incorporating them into the lab content. The critical-thinking skills were described and demonstrated using the assigned article and its information.

In the content-free condition, critical-thinking skills were taught in the lab but separately from the lab content. The first 15 or 20 minutes of the lab were spent discussing critical-thinking skills, exclusively. The rest of the lab time was spent in normal lab activities (for detailed lesson plans, see Appendix B).

Students in the the two remaining lab groups functioned as a control group. These labs were conducted in accordance with the normal classroom routine and did not include any special lessons on critical thinking.

Only those students who attended every lab during the treatment phase were included in the study. The content-based condition had 21 students. The content-free condition consisted of 52 students, and the control group contained 20 students.¹

Measures. One of the lab requirements was a series of written papers, one of which was to be turned in after every 3-week block. These papers consisted of student-generated applications of the articles and activities discussed in the previous labs. The purpose of the lab paper was to see if students could take information learned from the articles and activities and apply it to a real-life teaching situation. Differences in lab paper scores between the treatment and control labs were used to determine if knowledge of critical-thinking skills was put into practice and if that improved the quality of the papers. The assumption was that students using critical-thinking skills

¹Because of scheduling limitations, students could not be distributed evenly through the labs. That, and the irregular attendance in some labs, contributed to the disparate numbers of students in each group.

would be more effective at generating applications related to the main ideas in the articles and activities.

Two criteria were used in evaluating the lab papers: a standard criteria for grading papers developed from research in the area of writing evaluation (Capossela, 1993; Cless, 1988) used in determining students' grades in the class; and a slightly modified version of the criteria developed to more adequately measure students' use of the specific skills associated with the writing of the papers (see Appendix C). Two criteria were used so that no one group had any advantage over any of the other groups with regard to a final class standing. In both criteria, a perfect paper was worth 20 points. Papers were completed and scored during each of the three phases of the experiment.

Scores on regular class exams were also used as an indirect measure of the application of the critical-thinking skills. Three objective-referenced tests composed of 50 multiple-choice items were given during the quarter. Each test covered the block of information taught in the preceding 3 weeks. None of the tests were comprehensive (see Appendix F).

Each test was worth 100 points. Students filled in the answers on a Scantron form and the tests were scored using a Scantron machine. Each item was worth 2 points. Scores generated were equal to the percentage correct. A reliability index for this test was calculated and found to be .52.

Attitude surveys were administered to determine students' attitudes towards being taught the critical-thinking skills as opposed to participating in regular lab

activities (see Appendix D). Students rated the quality and expertise of the lab instructor and the overall quality of the lab on a scale of 1 to 10. There were nine questions exploring different aspects of the lab. Students rated each of these questions on a scale of 1 to 5 based on how much they agreed or disagreed with the statement.

Treatment Materials

The critical-thinking skills taught were taken from the Tactics for Thinking program created by Robert Marzano (1986). This particular program was chosen because of its adaptability to a variety of situations and its correspondence to the study's definition of critical thinking. Although initially designed as a content-free program, it was easily adapted for use with specific content as suggested in Marzano's extension sections (see Marzano & Arredondo, 1986). Many of the skills in this program corresponded in definition and objective to major skills in other critical-thinking programs (see Appendix E).

The second unit of skills from Marzano's program entitled Content-Thinking Skills was selected for this experiment. These skills were concept attainment, concept development, pattern recognition, and synthesizing. These particular skills were judged by the investigator and the class instructor to be most important for the writing of lab papers. For example, synthesizing is the summarizing of several pieces of information. In the lab papers, students were required to summarize briefly the articles they had read. Concept attainment and concept development were judged to be important to performance on tests, since many of the questions were attempting to assess students' understanding of new concepts discussed. Pattern recognition was

judged to be useful for both paper and tests. Pattern recognition would be useful in helping students set up and organize their paper as well as acquire an overall understanding of the class material. These skills also appeared to be common denominators in many critical-thinking programs based on the review of the literature. Appendix F describes these skills and their counterparts in other critical-thinking programs.

Lesson plans were created for both the content-free and content-based conditions utilizing the critical-thinking skills. The lessons were basically the same, but differed in one important aspect. In the content-based condition, the lab topic was used to demonstrate the thinking skills. In the content-free condition, the examples did not make use of the lab topic (see Appendix C).

Procedure

Pretreatment phase. Labs were taught in their traditional format for the first 3 weeks of the experiment. A lab paper was turned in and a test taken at the end of the phase.

Treatment phase. The treatments were instituted for the two experimental groups during the next 3 weeks. The control group continued with normal lab activities. A lab paper was turned in and a test taken at the end of this 3-week period.

Posttreatment phase. During the last three lab periods, normal lab activities were resumed for the two sets of experimental labs. At the end of this phase, students submitted their last papers, took a final test and completed an attitude survey.

RESULTS AND DISCUSSION

Performance on Lab Papers

To compare test and paper scores, mean scores and standard deviations were generated for each condition and each experimental phase. These are provided in Table 1. The results presented in Table 1 indicate there is little difference between the means of the paper scores when broken down by experimental condition. In the pretreatment phase, means were very similar as would be expected. During the treatment phase, means increased only slightly and the control group's mean (17.7) was slightly higher than that of the other groups (16.8 and 16.4). Means decreased in the posttreatment phase across all conditions.

A 3 x 3 ANOVA was conducted on the condition-by-experimental phases for the paper scores (see Table 2). The interaction and main effect for condition were not significant. However, the main effect for the experimental phase was significant $F(2, 3.2) p < .05$.

It is possible that students performed better on lab papers during the treatment phase due to increased experience in writing the papers. This performance may have decreased during the posttreatment phase due to end-of-the-quarter pressures (papers and final exams in other classes).

Performance on Tests

The means of the test scores presented in Table 1 again indicated some differences among the three phases. Means increased across all conditions from the pretreatment to the treatment phase and then decreased in the posttreatment phase.

Table 1

Mean Scores of Papers and Tests by Experimental Phase and Experimental Condition

	Condition			
	Content-Based	Content-Free	Control	Total
Paper Scores				
Pretreatment	16.5(2.5)	16.1(2.7)	16.1(2.6)	16.2(2.5)
Treatment	16.8(2.5)	16.4(2.8)	17.7(1.9)	17.3(2.3)
Posttreatment	15.7(2.3)	15.0(2.5)	16.3(2.4)	16.0(2.4)
Total	16.3(2.4)	15.8(2.7)	16.7(2.4)	16.5(2.5)
Test Scores				
Pretreatment	83.2(10.0)	78.7(8.7)	81.5(9.1)	81.3(9.2)
Treatment	88.5(8.2)	88.2(7.4)	85.4(10.1)	86.5(9.3)
Posttreatment	84.8(6.7)	81.2(8.2)	83.4(16.7)	83.2(13.8)
Total	85.5(8.5)	82.7(8.9)	83.4(12.5)	83.7(11.2)

Note. Standard deviations are provided within the parentheses.

Table 2

Results of 3x3 ANOVA between Experimental Condition and Paper Scores

	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Source				
Condition	16.64	2	8.3	.36
Phase	148.39	2	74.1	3.20*
Interaction	89.30	4	22.3	.96
Residual	16241.23	270	23.1	

* $p < .05$

A 3 x 3 ANOVA was conducted on the condition-by-experimental phase for the test scores. The results are reported in Table 3. The interaction was not significant. The main effect for experimental phase was significant, $F(2, 18.5) p < .01$. This again indicates some increase due to experience. The decrease during the postexperimental phase may again be due to end-of-the-quarter pressures. The lack of a significant interaction would indicate that the three groups did not significantly differ.

Table 3

Results of 3x3 ANOVA Between Experimental Condition and Test Scores

	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Source				
Condition	373.33	2	186.6	2.44*
Phase	2838.91	2	1419.4	18.50**
Interaction	383.47	2	95.8	1.25
Residual	20614.71	270	76.3	

* $p < .10$ ** $p < .01$

Affective Results

Means on the attitude survey by condition are provided in Table 4. One-way analyses of variance were performed on the instructor ratings and lab ratings by experimental condition. These results are provided in Tables 5 and 6.

Students in the content-free labs rated the quality of their lab ($\bar{M} = 7.6$) higher than those in the content-based labs ($\bar{M} = 6.4$) and the control labs ($\bar{M} = 6.8$). However, these differences were not statistically significant.

Table 4

Mean Scores of Attitude Survey Responses by Experimental Condition

	Condition		
	Content-based N=21	Content-free N=52	Control N=20
Survey Questions			
Lab Rating	6.4(1.8)	7.6(1.5)	6.8(1.7)
Instructor Rating	7.7(1.7)	8.5(1.2)	8.3(.93)
Question 1	2.2(.71)	2.3(.72)	2.2(.85)
Question 2	1.9(.30)	1.8(.77)	1.8(.52)
Question 3	2.1(.58)	1.8(.53)	2.1(.76)
Question 4	2.3(.87)	2.0(.73)	2.3(.85)
Question 5	3.1(1.1)	2.5(.94)	2.7(1.1)
Question 6	2.6(.94)	2.5(1.0)	2.4(1.0)
Question 7	2.8(1.1)	2.4(1.2)	2.8(1.2)
Question 8	1.8(.69)	1.5(.51)	1.6(.64)
Question 9	2.1(1.0)	2.2(.80)	1.9(.92)

Note. Standard deviations are provided within the parentheses.

Table 5

Results of One-Way Anova Between Experimental Condition and Lab Ratings

	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Source				
Condition	1.22	8	.15	.19
Residual	55.39	69	.80	

Table 6

Results of One-Way ANOVA Between Experimental Condition and Instructor Ratings

	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Source				
Condition	10.50	5	2.1	3.28*
Residual	46.10	72	.64	

* $p < .01$

Students in the content-free labs also rated their lab instructor ($\bar{M} = 8.5$) as more effective than did the content-based group ($\bar{M} = 7.7$) or the control group ($\bar{M} =$

8.3). The differences between these groups were found to be statistically significant, $F(5, 72) = 3.3, p < .01$, with the content-based group having a significantly lower mean score (see Table 6).

A one-way analysis of variance was performed on three of the nine questions considered most pertinent to the research question. None of these analyses yielded statistically significant results.

Discussion

The purpose of this study was to answer three questions. The results will be discussed in relation to those questions.

1. Will critical-thinking skills increase the quality of students' performance on assignments and tests?

Given the measures used in this study, the answer would have to be "no." Performance on the lab papers did not seem to improve with respect to experimental condition, nor was there any improvement on test performance.

One possible interpretation of this finding is that the critical-thinking skills taught had no effect on the students' performance of basic classroom tasks like test-taking or paper-writing. It may be that such skills were not as helpful in performing tasks, like paper-writing, where students had to generate their own ideas. An important criterion of the lab paper was the application, by the student, of the lab content. This requires a certain amount of creativity on the part of the student and is not directly related to the critical-thinking skills.

Perhaps the skills taught (concept attainment, concept development, synthesizing, and pattern recognition) did not lend themselves to performance on multiple-choice tests. These skills assist students in a level of analysis not necessary for such performance. Thus the skills were not utilized by the students because the task did not require it.

However, the few gains made by the treatment groups disappeared over time. Posttreatment assessment saw a decrease in scores on papers and tests. This could indicate that a longer intervention period is needed for the skills to have an impact.

2. Should these skills be content-based or content-free?

Because it was found that critical thinking skills have no effect on class performance, there is no evidence in this study to indicate that the one orientation is more effective than the other.

3. What effects do such skills have on students' attitudes towards the class?

Results were inconclusive but there was some indication that students in the content-based labs tended to rate their lab experience slightly lower than the other two conditions. These differences were significant when the students rated the effectiveness of their instructor.

In the content-based condition, the skills were presented along with the lab material. Students may have perceived such a presentation as an ineffective way of explaining the material. In addition, students in the content-based labs may have been unable to understand how such information could be applied outside of the lab, and, as

a result, felt the information was not useful. Such an attitude may have transferred to the instructor who was presenting the material.

However, in the content-free condition, the information on critical-thinking skills was discussed separately from the lab content. Such a separation may have seemed more natural to the students. The critical-thinking skills did not get tangled up in the discussion of lab content. The ratings by the control group add some support to this hypothesis. Presentation of lab content was basically the same in the content-free and control groups. The control group's instructors were also rated as more effective than the content-based groups.

CONCLUSION

Based on the results of this study, the findings might suggest that critical-thinking programs have little impact on the learning of students. There was little change in test scores and almost no change in the paper scores as a result of receiving instruction in the critical-thinking skills. Several limitations in the current study warrant further research before the general ineffectiveness of critical-thinking programs can be established.

There was no direct assessment of the students' critical thinking skills. It may have been that the skills were never acquired by the students. If the skills had not been acquired in the first place, such skills would have no effect on their performance..

Even if the skills were learned, it may have been that the students did not receive adequate practice in the skills. The lack of significant and lasting differences in student performance may have been a function of the length of the intervention. Treatment took place over a space of 3 weeks with students meeting once every week. Critical-thinking skills usually only took up approximately half of the period or about 20 to 25 minutes. The intervention may have been too brief for students to gain any significant understanding of the skills. For any skill to be used effectively, there must be a degree of automaticity necessary to be able to use the skills on a continual basis or to incorporate a lasting change in behavior. Learning theory would suggest that practice using the information is the best way to learn and acquire those skills.

In addition, instructors may not have received adequate training in the presentation of the critical-thinking skills. Though lesson plans developed were

detailed, no formal training by the program developers was conducted. Lack of instruction may have resulted in an inappropriate presentation of the skills. There also may have been problems with using a content-free program in a content-based environment. There may be some significant differences between content-free programs and content-based programs that may make a content-free program lose its effectiveness if presented with a particular content.

It could be that some skills may not be appropriate for all tasks. The lack of significant differences in the paper scores seems to indicate that the skills did little to assist the student in writing up the paper, a task which requires a certain amount of creativity on the part of the student. As mentioned in the literature review, there may be an important difference between critical-thinking skills and creative-thinking skills (see Perkins, 1984). It may be inappropriate to group these two categories of skills under the general heading of "critical-thinking skills." Program developers must be more aware of the differences between these skills and make sure they are used appropriately.

Although the results of the analysis of the paper scores suggest that critical-thinking skills may have little impact on more creative endeavors, this conclusion must be moderated by an alternative explanation. The lack of significant differences on the lab paper scores may have been due to the lack of variability in the paper scores. The paper scores had a maximum score of 20 and a minimum score of 1. However, most of the scores did not fall below 10, severely restricting the range of scores and

reducing the variability. A more stringent and specific criterion used in scoring the papers may have yielded different results.

It is possible that the measures utilized were inappropriate for measuring the effect of critical-thinking skills. As mentioned, there was not much variability for the paper scores, but the scoring criteria may have been targeting inappropriate skills. As a result, changes that may have resulted were not picked up during the scoring procedures. In addition, the objective-referenced tests were not given during the lab time but during class time. The students may have learned the lab material well, but that material was never directly tested. The sharp separation between lab and class may have inhibited any transfer of the skills. In addition, lab material and class material were not exactly the same. Perhaps more standardized measures must be used to pick up any meaningful differences when comparing critical-thinking programs.

Finally, there was little motivation for students to put these skills to practical use. The skills were simply presented to the students. No mention was made of using the skills to study for tests or improve the papers. The skills were also part of the lab content, which was never directly tested. Students may not have used the skills simply because they felt no motivation to put them to use. To be effective, it may be necessary to explain to students exactly how these skills can be used.

Results from the attitude surveys indicate that the content-free condition was perceived as being a more favorable way of presenting the material. Since the two lab instructors taught in all three conditions, there is little chance that the ratings could be attributed solely to an instructor's characteristics.

Future Research

This study attempted to use classroom measures in assessing critical-thinking programs. Future studies that concentrate on using actual classroom measures rather than traditional standardized tests should make sure the measures have adequate reliability and validity. If possible, these studies should randomly assign subjects to the different conditions to assure that there are no group characteristics to which the change in performance may be attributed.

A replication of this study using a longer intervention period and some incentives for student use of skills might yield more significant findings. However, it may be necessary to compare not one critical thinking program used in different ways, but two critical thinking programs, one content-based and the other content-free, to make conclusions of the effectiveness of the one over the other. Ideally, a series of experiments should be planned, comparing several content-based programs with several content-free programs, since each program may have some individual characteristic that makes it superior over the others. In this way, the content-based and content-free distinctions could be more adequately made.

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APPENDICES

APPENDIX A:
EXPERIMENTAL DESIGN

EXPERIMENTAL DESIGN

Experimental Phases	Experimental Group (Content-Free)	Experimental Group (Content-Based)	Control
Pretreatment	3 weeks normal lab assessment	3 weeks normal lab assessment	3 weeks normal lab assessment
Treatment	3 weeks enhanced lab assessment	3 weeks enhanced lab assessment	3 weeks normal lab assessment
Posttreatment	2 weeks normal lab assessment	2 weeks normal lab assessment	2 weeks normal lab assessment

APPENDIX B:
LESSON PLANS FOR CRITICAL THINKING LABS

LESSON PLANS FOR CRITICAL THINKING LABS

LAB 4 (Content-free)

Critical thinking skill: concept attainment/concept development

Lesson Plan for Concept Attainment

1. Present students with a simple concept they already know and ask them to identify what comes to mind when they hear the word. Use the word "dog."
2. Have students share their experiences. Write responses on the board.
3. Using students' responses, demonstrate that knowing a word is actually knowing a label for a set of experiences.
4. Point out that you don't usually think of a definition when you hear a word but you do talk to yourself about the word. Have students try to hear what they say to themselves about the concept being presented to them.
5. Point out that you also have mental pictures, sensations, and emotions associated with a word. Have students identify the mental pictures, physical sensations, and emotions they associate with the concept.
6. Present and model the concept attainment process. Use the concept previously presented to students. (dog)
 - a. provide a direct or indirect experiential base for the new concept with a classroom activity or personal examples of your experiences of the concept. (If possible, I will bring my dog for a brief experience. If not possible, I will provide some pictures for you to show.)
 - b. have students describe the concept in terms of their experiences. (That present experience or past experiences)
 - c. With the information in (a.) have students form a strong mental image of the new concept.
 - d. Have students say the word to themselves so they can hear it in their minds' ear.
 - e. Have students see the word (the orthographic label) in their mind's eye. (Have them picture the word 'dog')

7. Introduce and define "concept attainment." Explain it can be useful in learning new vocabulary. Describe the "concept attainment" process. Handouts with the process will be provided.
8. Have students learn a new concept using the concept attainment process. The concept will be "drill" (the farm machine not the tool)
 - a. provide experiential base (pictures will have to suffice)
 - b. students describe new concept in terms of their experiences
 - c. students generate a strong mental image
 - d. students say the word to themselves so they can hear it.
 - e. students see the word in their mind's eye.

Lesson Plan for Concept Development

1. Present students with a concept that they have already attained (use dog again) Have them write all the information they can think of about the concept within a given period of time. Allow students to share their answers with the class.
2. Tell the students to form small groups and identify the category or class to which the concept belongs. Have each group report its findings and come to a class decision as to the best category to represent the concept (such as "animal" or "pet").
3. Again in small groups, have students identify examples of the concept along with concepts that are similar and dissimilar within the major category.
4. Discuss as a class the important attributes of the concept based on what was learned from the previous activity.
5. Have students write a definition of the concept.
6. Have students read what they wrote about the concept at the beginning of class. Have them compare their level of knowledge of the concept at the end of class with their level at the beginning. Emphasize that their knowledge base has deepened and enriched.
7. Explain that they have gone through the concept development process.
8. Introduce and define concept development. Explain it's helpful in giving us a detailed technical knowledge of the concept. Handout with the concept development process on it.

9. If time, go through the concept development process with the word "drill."

Lab 4 (Content-based, Article 15)

Critical thinking skill: concept attainment/concept development

Lesson Plan for Concept Attainment

1. Ask students to describe what comes to mind when you say the word "positive reinforcement."
2. Have students share their experiences with the class. Write some on the board.
3. Using the responses, demonstrate that the label "positive reinforcement" is really just a label for a set of experiences.
4. Point out that you don't commonly think of a definition when you hear a word but you often talk to yourself about the word. Have students try to hear what they say to themselves about the presented concept.
5. Point out that you also have mental pictures, sensations, and emotions associated with a word. Have students identify the mental pictures, physical sensations, and emotions they associated with "positive reinforcement."
6. Present and model the concept attainment process. Use the concept previously presented to students. (positive reinforcement)
 - a. provide a direct or indirect experiential base for the new concept with a classroom activity or personal examples of your experiences of the concept. (Have students tell how any of the different techniques described in the article have been helpful to them, e.g. using nonverbal reinforcement, token economies, etc.)
 - b. have students describe the concept in terms of their experiences. (That present experience or past experiences)
 - c. With the information in (a.) have students form a strong mental image of the concept.
 - d. Have students say the word to themselves so they can hear it in their minds' ear.
 - e. Have students see the word (the orthographic label) in their mind's eye. (Have them picture the word 'positive reinforcement')

7. Introduce and define "concept attainment." Explain it can be useful in learning new vocabulary. Describe the "concept attainment" process. Handouts with the process will be provided.
8. Have students learn a new concept using the concept attainment process. The concept will be "premaking."
 - a. provide experiential base (stories where it has been put to use)
 - b. students describe new concept in terms of their experiences
 - c. students generate a strong mental image
 - d. students say the word to themselves so they can hear it.
 - e. students see the word in their mind's eye.

Lesson Plan for Concept Development

1. Present students with a concept that they have already attained (use "positive reinforcement" again) Have them write all the information they can think of about the concept within a given period of time. Allow students to share their answers with the class.
2. Tell the students to form small groups and identify the category or class to which the concept belongs. Have each group report its findings and come to a class decision as to the best category to represent the concept (such as "behavioral technique" or "discipline method").
3. Again in small groups, have students identify examples of the concept along with concepts that are similar and dissimilar within the major category (for example, the similarity to negative reinforcement and punishment as well as the differences).
4. Discuss as a class the important attributes of the concept based on what was learned from the previous activity.
5. Have students write a definition of the concept.
6. Have students read what they wrote about the concept at the beginning of class. Have them compare their level of knowledge of the concept at the end of class with their level at the beginning. Emphasize that their knowledge base has deepened and enriched.
7. Explain that they have gone through the concept development process.

8. Introduce and define concept development. Explain it's helpful in giving us a detailed technical knowledge of the concept. Handout with the concept development process on it.
9. Use concept development process with "premacking."

LAB 5 (Content-free)**Critical Thinking Skill:** pattern recognition

Lesson Plan

1. Present students with a passage that contains two or more of the basic patterns. Have them read the passage, and then ask them to describe the basic idea behind the passage (Don't use the word "main idea")
2. Have students share their descriptions with the rest of the class. As they share their ideas, write a few of them on the board, trying to state each description in terms of one of the basic patterns (not mentioning these patterns by name yet).
3. Describe for students at least two ways you can see to organize the information. These two ways should represent two of the basic patterns.
4. Ask students, "Why can we see so many ways of organizing this information that make sense?" Emphasize two points (1) the way you organize information is subjective (2) even if two people use different organizational schemes, they will still probably include much of the same information in their organization.
5. Define pattern recognition and the value it has in storing information.
6. Introduce two of the five different pattern types namely:
concept patterns
sequence patterns (later, you can mention the other three: generalization, process or cause, similarity or dissimilarity)
7. Describe the pattern recognition process:
 1. Look for one of the patterns in information you read or hear
 2. If you can't find a pattern, adapt or invent one to help you organize information.
8. Describe the two patterns you used to identify patterns in the passage.
9. If time, present another passage and have student identify the pattern there. Might be a good way to introduce the remaining three patterns.

LAB 5 (Content-based-Article 13)**Critical Thinking Skill:** pattern recognition

Lesson Plan

1. Have students describe the basic idea behind article 13. Write it down on a piece of paper or just think about it. (Don't use the word "main idea.")
2. Have students share their descriptions with the rest of the class. As they share their ideas, write a few of them on the board, trying to state each description in terms of one of the basic patterns (not mentioning these patterns by name yet).
3. Describe for students at least two ways you can see to organize the information. These two ways should represent two of the basic patterns. (Outline to be provided)
4. Discuss the ideas of the article in terms of the patterns. Showing how each relates to the other.
5. Define pattern recognition and the value it has in storing information.
6. Introduce two of the five different pattern types namely:
concept patterns
sequence patterns (later, you can mention the other three: generalization, process or cause, similarity or dissimilarity)
7. Describe the pattern recognition process:
 - a. Look for one of the patterns in information you read or hear
 - b. If you can't find a pattern, adapt or invent one to help you organize information.
8. Describe the two patterns you used to identify patterns in the article. Mention other three patterns, if time.

LAB 6 (Content-free)**Critical thinking skill:** synthesizing

Lesson Plan

1. Have students recall a movie they have recently seen or a book they have recently read. Tell them to simply go over the movie or book in their minds without saying anything to anybody.
2. Next, have students graphically or symbolically represent the information. Provide a model you have done on a reading selection. (I will provide this)
3. Share them with class.
4. Have students write the information contained in their graph in a sentence or two. Have students share these with the class.
5. Explain to students that they have just gone through the synthesizing process. Define synthesizing and its importance.
6. Model the process on a selection of your own (to be provided). Show some of the different types of graphic representations (handout). Emphasize the subjective nature of the process.
7. Define the process:
 - a. Identify a pattern that includes important information
 - b. Write the information in the pattern in an informal outline or represent it graphically
 - c. Rewrite the outlined information in a sentence or two.
8. Discuss the article as you normally might with pertinent activities.

LAB 6 (Content-based-Article 14)**Critical thinking skill:** synthesizing

Lesson Plan

1. Have students go over the article in their minds without saying anything to anybody.

2. Next, have students graphically or symbolically represent the information. Provide a model you have done on a reading selection. (I will provide this)
3. Share them with class.
4. Have students write the information contained in their graph in a sentence or two. Have students share these with the class.
5. Explain to students that they have gone through the synthesizing process. Define synthesizing and its importance.
6. Show some of the different types of graphic representations (handout). Emphasize the subjective nature of the process.
7. Define the process:
 - a. Identify a pattern that includes important information
 - b. Write the information in the pattern in an informal outline or represent it graphically
 - c. Rewrite the outlined information in a sentence or two.
8. Discuss metacognition as you normally would with activities you feel to be pertinent.

APPENDIX C:
APPLICATION PAPER CRITERIA

APPLICATION PAPER CRITERIA

Points	Description
2	The paper addresses the main topic of the lab. (Pattern Recognition)
3	The paper gives a brief but effective summary of the article in which the main points of the article are identified. (Synthesizing)
3	All descriptions of theories or principles are accurate and complete. (Concept Attainment and Concept Development)
5	Three applications are provided and all are appropriate to the student. Applications are explanations of how the student would make use of the particular principle in his or her class room.
5	The applications provided are specific enough that you could, more or less, perform the action yourself.
2	The paper brings up one or two ideas not directly stated in the article.

APPENDIX D:
QUESTIONNAIRE

QUESTIONNAIRE

Lab (Day of Week): _____

Name of Lab Instructor: _____

Major: _____

On a scale of 1 to 10 with 10 being superior, rate:

the overall quality of the lab experience ____

the teaching ability of your lab instructor ____

For the following questions, use the scale below and place a number of the blank before the question.

1	2	3	4	5
Strongly agree	Agree	No opinion	Disagree	Strongly disagree

- ___ 1. The articles assigned to read were interesting.
- ___ 2. The articles assigned to read were informative.
- ___ 3. The lab activities were interesting.
- ___ 4. The lab activities were informative.
- ___ 5. The lab activities were helpful in understanding the course material.
- ___ 6. The lab activities were helpful in applying class concepts in other settings.
- ___ 7. The lab experience helped make the course more enjoyable.
- ___ 8. The lab instructor presented the lab concepts clearly.

- 9. The lab experience was helpful in writing the application papers.

Please answer the questions briefly.

10. The most beneficial part of the lab was:
11. The part of the lab I liked the least was:
12. Which activities conducted in lab helped in understanding course material?
13. What would you do to improve the lab?

APPENDIX E:

CORRESPONDENCE OF "TACTICS FOR THINKING" SKILLS WITH OTHER
CRITICAL THINKING SKILLS

CORRESPONDENCE OF "TACTICS FOR THINKING" SKILLS WITH
OTHER CRITICAL THINKING SKILLS

<u>Programs</u>	Concept Attainment	Concept Development	Pattern Recognition	Synthesizing
<u>Structure of Intellect</u> Meeker (1991)	concept formation	differentiate concepts		
<u>Instrumental Enrichment</u> Link (1991)	categorization	categorization	organiz. of dots/ analytic perception	
<u>Think to Write</u> Link (1991)	conceptualization	conceptualization	relevant information	
<u>Expand Your Thinking</u> Hyerle (1991)	qualification	classification	qualification	
<u>Philosophy For Children</u> Lipman (1991)	concept formation skills	concept formation skills		translation skills
<u>Building Thinking Skills</u> Baker (1991)	classifying	classifying	figural sequence	
<u>Odyssey</u> Wright (1991)				understanding language
<u>Developing Thinking Skills</u> deSanchez (1991)	basic processes	basic processes		basic processes
<u>HOTS</u> Pogrow (1991)				information synthesis

APPENDIX F:

TESTS

PSY 366 - EXAM I

1. Psychologists agree on all the following issues with regards to development **except**
 - (a) people develop at different rates.
 - (b) development occurs in stages.
 - (c) development is orderly.
 - (d) development is gradual.

2. Which of the following does NOT help to define "scheme"?
 - (a) They are like file folders.
 - (b) They are psychological occurrences that tend to repeat.
 - (c) They are cognitive structures.
 - (d) They are static and resistant to change.

3. According to Piaget, the cognitive arrangement of experiences into coherent systems is called
 - (a) organization.
 - (b) elaboration.
 - (c) abstract operations.
 - (d) cognitive systemization.

4. Which of the following helps define the process of assimilation?
 - (a) It operates independently of schemes.
 - (b) It weakens existing schemes.
 - (c) It creates new schemes.
 - (d) It strengthens existing schemes.

5. Which of the following is a correct definition of "accommodation"?
- (a) The changing of the physical environment in order to accommodate new stimuli.
 - (b) The changing of a person's cognitive structures in order to make sense of the environment.
 - (c) The equilibration of changing qualitative stimuli.
 - (d) The process by which existing schemata have information added to them.
6. According to Piaget, the driving force behind assimilation and accommodation is
- (a) schema control.
 - (b) the child's parents.
 - (c) disequilibrium.
 - (d) developmental reversibility.
7. Which of the following is NOT characteristic of a child in the sensorimotor stage?
- (a) The child becomes aware of the existence of entities that are not presently observable.
 - (b) The child acquires knowledge through physical experience with the environment.
 - (c) The child's cries become differentiated.
 - (d) The child is able to form mental operations.
8. How does Piaget label actions which are performed cognitively?
- (a) operations
 - (b) reversible cognitions
 - (c) internal actions
 - (d) preoperations

9. If a person begins to consider situations that are not in his or her present environment then he or she is probably entering the stage of
- (a) concrete operations.
 - (b) conservation.
 - (c) formal operations.
 - (d) preoperations.
10. Carolyn is listening to a song on earphones. When her mother asks her what she is listening to, Carolyn replies, "Can't you hear it?" This is an example of
- (a) conservation.
 - (b) egocentrism.
 - (c) irreversibility.
 - (d) overgeneralization.
11. One-way logic or perceptual centration would be most clearly illustrated by which of the following examples?
- (a) A child talks only to his parents.
 - (b) A child notes the shape of a lollipop but not the flavor.
 - (c) A child begins to use two-word phrases.
 - (d) A child understands that subtraction is a reversal of addition.
12. Which of the following begin in the concrete operations stage?
- (a) egocentric reasoning
 - (b) symbol representation
 - (c) abstract reasoning
 - (d) mental reversibility
13. Which of the following is an argument against Piaget's theory?
- (a) It is too complicated to be a completely accurate explanation.
 - (b) Later researchers have found his theory to be invalid.
 - (c) An individual can be in more than one stage at a time.
 - (d) All of the above.

14. The onset of the formal operations stage is associated with the beginning of
- (a) the use of language.
 - (b) classification and compensation skills.
 - (c) conservation.
 - (d) psychosocial development.
15. Which best reflects Vygotsky's general position?
- (a) Children should be pushed to the limit of their abilities.
 - (b) Children should be pushed to the limit of their abilities, but someone should be there to help them.
 - (c) Children should be pushed to the limit of their abilities, and then be shown how to learn from their mistakes.
 - (d) Children should not be pushed to the limit of their abilities.
16. Which of the following is not a part of Flavell's information processing view of development?
- (a) metacognition
 - (b) language acquisition
 - (c) attention
 - (d) memory
17. Which theory of language development proposes that language and cognition become interrelated after two years of age?
- (a) cognitivist
 - (b) innatist
 - (c) social contextual
 - (d) all of the above
18. What is the language acquisition device?
- (a) Piaget's explanation for how language is acquired.
 - (b) A language learning machine that Chomsky has urged educators to use.
 - (c) A hypothesized natural ability of all people to learn language.
 - (d) A psychological mechanism that separates language and thought.

19. Mrs. Johnson is asked to talk to Henrietta, a four-year old girl she has never met before. As they speak, Mrs. Johnson finds it difficult to understand what Henrietta is saying. What does Henrietta have a problem with?
- (a) intelligibility
 - (b) semantics
 - (c) pragmatics
 - (d) metalinguistics
20. A man has a dream one night that he's a tepee. The next night he dreams he's a wigwam. This continues for several week with the same two dreams about tepees and wigwams alternating. In desperation, the man finally goes to a doctor and explains his problem. The doctor nods and hum and haws and finally says, "I know what your problem is. You're two tents." If you failed to understand the above joke, what aspect of language might you be deficit in?
- (a) phonology
 - (b) syntax
 - (c) semantics
 - (d) pragmatics
21. Johnny's parents are worried he has begun to use language that appears to be inappropriate. He says things like, "I saw a lion" when in actuality, he saw a tiger. The problem that Johnny is most likely experiencing has been called
- (a) overgeneralization.
 - (b) undergeneralization.
 - (c) overregularization.
 - (d) underregularization.
22. What is the relationship of our expressive vocabulary to our receptive vocabulary?
- (a) Our expressive vocabulary is larger than our receptive vocabulary.
 - (b) Our receptive vocabulary is larger than our expressive vocabulary.
 - (c) Expressive and receptive vocabularies are equal.
 - (d) Our expressive vocabulary starts out larger then gradually decreases.

23. Which of the following aspects of language refer to the way in which sentences are formed?
- (a) phonology
 - (b) syntax
 - (c) semantics
 - (d) pragmatics
24. At the stage of Trust vs. Mistrust, the crucial issue is whether or not the
- (a) exploratory environment is safe.
 - (b) basic needs are met.
 - (c) social contacts have been honest.
 - (d) personality has been manipulated.
25. At the stage of Identity vs. Role Confusion, the most definitive issue is whether or not a person's
- (a) sense of intimacy with a significant other.
 - (b) sense of sexuality has developed.
 - (c) place in society has been satisfactorily realized.
 - (d) role in society facilitates higher level thinking.
26. Which of Erikson's stages is probably being experienced if a person is realizing that his life has not accomplished anything meaningful?
- (a) autonomy vs. shame
 - (b) identity vs. role confusion
 - (c) generativity vs. stagnation
 - (d) ego integrity vs. despair
27. Linda frequently decides to ignore her schoolwork, has no permanent friendships, and does not know what she wants in life or even what she wants for today. Which identity status would best characterize Linda?
- (a) achievement
 - (b) diffusion
 - (c) foreclosure
 - (d) moratorium

28. Bob's father was a dentist. His grandfather was a dentist. All of Bob's brothers have become dentist. If Bob decides to be a dentist, what identity status is he most likely in?
- (a) achievement
 - (b) diffusion
 - (c) foreclosure
 - (d) moratorium
29. In comparison to elementary students, the friendships of junior high students tend to be:
- (a) more committed.
 - (b) less important.
 - (c) less intimate.
 - (d) more one sided.
30. Which of the following are most likely to develop leadership skills?
- (a) early-maturing girls
 - (b) late-maturing girls
 - (c) early-maturing boys
 - (d) late-maturing boys
31. Sex Roles develop from which of the following areas?
- (a) Parents interacting differently with sons and daughters.
 - (b) The roles the parents play in care for the child.
 - (c) How teachers interact with students.
 - (d) All of the above.
32. The impact of day care on low income students has had the following effect:
- (a) good for intellectual development but not for social development.
 - (b) good for social development but not for intellectual development.
 - (c) good for both intellectual and social development.
 - (d) not good for either intellectual or social development.

33. When children realize that moral principles are not carved in stone, they are using the Piagetian principle of
- (a) moral realism.
 - (b) morality of constraint.
 - (c) preconventional morality.
 - (d) morality of cooperation.
34. Sarah keeps her desk top clean because she knows the teacher will give her a reward. What level of moral thinking is Sarah exhibiting?
- (a) preconventional morality
 - (b) conventional morality
 - (c) post-conventional morality
 - (d) reinforcement morality
35. Which of the following is characteristic of a child's morality of constraint?
- (a) Following any rule is constrained by the dictates of individual conscience.
 - (b) Severity of disobedience is determined by the type of punishment.
 - (c) Punishment should be based upon the interpretation of the circumstances of the infraction.
 - (d) Disobedience is affected by moral flexibility and reciprocity.
36. Albert feels that if he doesn't get caught, then he has done nothing wrong. What level of moral reasoning is he using?
- (a) preconventional
 - (b) conventional
 - (c) postconventional
 - (d) relativistic

37. Research indicates that the likelihood of a student cheating depends primarily upon
- (a) the student's moral development.
 - (b) the student's cognitive development.
 - (c) situational factors.
 - (d) self-concept of the student.
38. Which of the following factors are **not** necessary for creativity?
- (a) fluency
 - (b) originality
 - (c) high intelligence
 - (d) flexibility
39. When it comes to the meaning of intelligence, psychologists
- (a) agree.
 - (b) disagree.
 - (c) are generally neutral.
 - (d) are adamant.
40. Which subtheory of Sternberg's intelligence theory explains intelligent behavior according to interactions with the environment?
- (a) componential
 - (b) experiential
 - (c) contextual
 - (d) none of the above
41. A wealthy, 4.0 student, who is found in the midst of an inner city environment and does not know how to survive, is probably
- (a) lacking in contextual intelligence.
 - (b) lacking in experiential intelligence.
 - (c) a victim of too much general intelligence.
 - (d) quite adaptive in most other environments.

42. Which type of student takes his/her time and evaluates alternative answers?
- (a) analytic
 - (b) impulsive
 - (c) reflective
 - (d) thematic
43. Which type of student tends to seek patterns of the whole?
- (a) analytic
 - (b) impulsive
 - (c) reflective
 - (d) thematic
44. Patsy has a high standard for her children, but she also loves to talk with them and listen to them. Which parenting style is most characteristic of Patsy?
- (a) authoritarian
 - (b) authoritative
 - (c) indifferent
 - (d) permissive
45. Rebecca has two small children and constantly worries about whether she's doing the right thing. As a result, her discipline is often inconsistent and her children are given whatever they want. Which parenting style would describe Rebecca?
- (a) authoritarian
 - (b) authoritative
 - (c) indifferent
 - (d) permissive
46. Which view of intelligence suggests that there is one global intelligence that encompasses all our behaviors?
- (a) Spearman's view
 - (b) Guilford's view
 - (c) Piaget's view
 - (d) Sternberg's view

47. Which of the following would be an example of cultural differences?
- (a) Billy, a first grader, reads at a third grade level. His parents take a great deal of interest in his education.
 - (b) Francis has struggled with communication skills and social skills all her life. She was born with a cleft palate.
 - (c) Jennie scores high on I.Q. tests. Jennie's father is a Nobel-winning physicist and her mother is the CEO of a Fortune500 corporation.
 - (d) Timothy cannot distinguish between beer and wine on a preschool test. His parents are Mormons.
48. Jennifer is able to generate many solutions to problems. What aspect of creativity is Jennifer demonstrating?
- (a) fluency
 - (b) originality
 - (c) flexibility
 - (d) convergence
49. What is the relationship between heredity and environment?
- (a) Heredity produces potential while environment determines how much potential is realized.
 - (b) Heredity affects intelligence only.
 - (c) Environment has the greatest influence over an individual's development.
 - (d) Heredity has the greatest influence over an individual's development.
50. Which individual associated intelligence with 120 separate abilities?
- (a) Thurstone
 - (b) Guilford
 - (c) Weschler
 - (d) Piaget

KEY

- | | |
|---------|---------|
| 1. (b) | 38. (c) |
| 2. (d) | 39. (b) |
| 3. (a) | 40. (c) |
| 4. (d) | 41. (a) |
| 5. (b) | 42. (c) |
| 6. (c) | 43. (d) |
| 7. (d) | 44. (b) |
| 8. (a) | 45. (d) |
| 9. (a) | 46. (a) |
| 10. (b) | 47. (d) |
| 11. (b) | 48. (c) |
| 12. (d) | 49. (a) |
| 13. (c) | 50. (b) |
| 14. (b) | |
| 15. (b) | |
| 16. (b) | |
| 17. (c) | |
| 18. (c) | |
| 19. (a) | |
| 20. (d) | |
| 21. (a) | |
| 22. (b) | |
| 23. (b) | |
| 24. (b) | |
| 25. (c) | |
| 26. (d) | |
| 27. (b) | |
| 28. (c) | |
| 29. (a) | |
| 30. (c) | |
| 31. (d) | |
| 32. (c) | |
| 33. (d) | |
| 34. (a) | |
| 35. (b) | |
| 36. (a) | |
| 37. (c) | |

PSY 366 - Exam II

1. Which of the following best illustrates LEARNING?
 - (a) Withdrawing your hand from a hot stove.
 - (b) Avoiding a dog who is sitting by the road.
 - (c) Blinking your eye when smoke is blown into it.
 - (d) Wanting to eat when you are hungry.

2. Cognitive learning theories focus on
 - (a) observable behaviors.
 - (b) mental processes.
 - (c) physical activities.
 - (d) decision-making.

3. Behavioral theories of learning emphasize
 - (a) thinking.
 - (b) development.
 - (c) observable actions.
 - (d) all of the above.

4. The principle of contiguity involves an association between
 - (a) two events through rewards.
 - (b) a negative and a positive stimulus.
 - (c) two events through continual pairing.
 - (d) emotion and behavior.

5. During music class, Rhonda enthusiastically sings aloud with her class, but the teacher comments, "Rhonda, please ... you sound like an owl in a torture chamber." Rhonda turns bright red and suffers stomach pains. Thursday, as soon as Rhonda sees her music class she feels ill. Rhonda's reaction is most explicitly illustrative of
- (a) social learning.
 - (b) cognitive learning.
 - (c) classical conditioning.
 - (d) operant conditioning.
6. In the above example involving Rhonda, feeling ill at the prospect of going to music class served as the
- (a) conditioned response.
 - (b) conditioned stimulus.
 - (c) unconditioned response.
 - (d) unconditioned stimulus.
7. In classical conditioning, the stimulus that automatically provokes a response before the conditioning takes place is referred to as the
- (a) neutral stimulus.
 - (b) unconditioned stimulus.
 - (c) antecedent cue.
 - (d) contiguous stimulus.
8. Sam and Bones run to the food dish whenever they hear the electric can opener. One day they hear an electric drill and run to their food dish. Their response is due to
- (a) discrimination.
 - (b) generalization.
 - (c) extinction.
 - (d) reversion.

9. Which of the following is NOT an example of the appropriate use of classical conditioning in the classroom?
- (a) Associate pleasant events with learning.
 - (b) Devise small steps to move into feared situations.
 - (c) Emphasize differences to learn discrimination.
 - (d) Allow children to avoid contact with feared situations.
10. Climbing onto the kitchen counter permits access to the cookie jar. Lucas repeatedly climbs onto the counter to get at the cookies. This is an example of
- (a) the law of effect.
 - (b) classical conditioning.
 - (c) a new response to neutral stimulus.
 - (d) the Keebler Effect.
11. B.F. Skinner is to _____, as Ivan Pavlov is to _____.
- (a) cognitive learning, classical conditioning
 - (b) operant conditioning, classical conditioning
 - (c) classical conditioning, operant conditioning
 - (d) classical conditioning, cognitive learning
12. Marnie was scratched by a black cat when she was very young. Now she hates black horses, black dogs, and black cars. She demonstrates
- (a) extinction.
 - (b) negative reinforcement.
 - (c) discrimination.
 - (d) generalization.
13. According to both Thorndike's and Skinner's theories, behavior is affected by
- (a) the stimuli that trigger it.
 - (b) the subject's interpretation of the behavior.
 - (c) the consequences that follow the behavior.
 - (d) the subject's control over the situation.

14. Removing an aversive stimulus to increase the frequency of a behavior is
- (a) positive reinforcement.
 - (b) negative reinforcement.
 - (c) presentation punishment.
 - (d) removal punishment.
15. A stimulus is defined as a reinforcer or a punisher depending on whether it
- (a) is pleasurable or uncomfortable for the subject receiving it.
 - (b) increases or decreases the frequency of the behavior it follows.
 - (c) occurs antecedent to or as a consequence of the behavior.
 - (d) is designed to promote or suppress behavior.
16. Seventeen-year-old Kelly receives a ticket for speeding. Her parents take away the privilege of the use of the car. Her parents are using
- (a) positive reinforcement.
 - (b) negative reinforcement.
 - (c) presentation punishment.
 - (d) removal punishment.
17. Performance speed is increased most quickly by _____ schedules.
- (a) fixed interval
 - (b) fixed ratio
 - (c) variable ratio
 - (d) variable interval
18. Saunders hates sending in his income tax form every year but constantly worries that his return will be the "one" selected for auditing. Thus he completes it honestly to avoid a penalty. Which reinforcement schedule is most clearly involved?
- (a) Fixed-ratio
 - (b) Fixed-interval
 - (c) Variable-ratio
 - (d) Variable-interval

19. Persistence is likely to be increased by
- (a) fixed interval schedules.
 - (b) fixed ratio schedules.
 - (c) variable ratio schedules.
 - (d) variable interval schedules.
20. Which schedule of reinforcement is involved when teachers give pop quizzes?
- (a) fixed-ratio
 - (b) variable-interval
 - (c) variable-ratio
 - (d) fixed-interval
21. Your turn on your water faucet to get a drink. Which schedule of reinforcement typically prevails?
- (a) fixed-interval
 - (b) variable-ratio
 - (c) continuous
 - (d) variable-interval
22. Lionel was humiliated when he forgot his lines in a play. Now he refuses to take part in any speech class functions. His teacher would do well to
- (a) bring him back into participation in small steps.
 - (b) leave him alone until the feeling has extinguished itself.
 - (c) help him regain his confidence by assigning him a major role in a play.
 - (d) joke with him about the problem until he is more comfortable.
23. Sarah has a few students who are occasionally disruptive in class, so she tries to praise their positive behavior. When they have been quiet for a few minutes, she says "Good, Joe and Renee." This is likely to be ineffective because it
- (a) reinforces the wrong behavior.
 - (b) doesn't specify the behavior.
 - (c) occurs too infrequently.
 - (d) is not individually directed.

24. One of the best ways to determine possible reinforcers is to
- (a) observe what students choose to do in their free time.
 - (b) establish a student committee and have them vote.
 - (c) ask more experienced teachers for their suggestions.
 - (d) set up activities to see if students enjoy them.
25. Theresa, the math teacher, always explains how "her mind works" when she solves a problem. She is using the technique of
- (a) discrimination training.
 - (b) shaping.
 - (c) modeling.
 - (d) cueing.
26. The essential difference between negative reinforcers and punishment is
- (a) punishment is presented after the behavior.
 - (b) punishment decreases behavior while negative reinforcement increases it.
 - (c) negative reinforcement decreases misbehavior more quickly.
 - (d) punishment is more effective in bringing about positive change.
27. Sam enters the classroom, puts his foot in the wastebasket, and drags it around the room to the delight of his peers. When his teacher insists that he continue the behavior, she is attempting to use
- (a) extinction.
 - (b) negative reinforcement.
 - (c) satiation.
 - (d) punishment.
28. To use punishment as part of a two-prong attack, punishment should be accompanied by
- (a) sharp reprimands.
 - (b) positive alternatives.
 - (c) satiation.
 - (d) negative reinforcement.

29. A teacher sets up a behavior management program in which the class may earn free time through good behavior. The teacher is using a strategy comparable to
- (a) a contingency contract.
 - (b) the Good Behavior Game.
 - (c) the Premack Principle.
 - (d) a token economy.
30. When reinforcing students, it is best to emphasize that the reinforcement symbolizes
- (a) skill improvement.
 - (b) teacher approval.
 - (c) compliance.
 - (d) higher grades.
31. Researchers have found that using only behavioral techniques with students may lead to
- (a) modeling positive behaviors for other students.
 - (b) higher levels of achievement.
 - (c) a decreased interest in learning.
 - (d) an increased interest in learning.
32. Which of the following is consistent with the cognitive approach?
- (a) Learning is independent of environmental consequences.
 - (b) Learning is dependent of elicited responses.
 - (c) The same event means the same things to different people.
 - (d) The same event means different things to different people.
33. Cognitive psychologists are most interested in the role of
- (a) activity.
 - (b) reinforcement.
 - (c) knowledge.
 - (d) socialization.

34. The system of receptors for seeing, hearing, tasting, smelling, and feeling is called
- (a) sensory spectrum.
 - (b) sensory register.
 - (c) Pragnanz.
 - (d) short-term memory.
35. Perception may be thought of as
- (a) the pattern we attach to sensory information.
 - (b) collections of sensations.
 - (c) neural activity.
 - (d) objective reality.
36. Research has shown that the capacity of the short-term memory is limited to about _____ chunks.
- (a) 2 - 4
 - (b) 5 - 9
 - (c) 11 - 12
 - (d) 13 - 15

37. Permanent storage of information requires that the information be
- (a) rehearsed.
 - (b) of limited length.
 - (c) organized.
 - (d) chunked.
38. What you are thinking about right now is being held in your _____ memory.
- (a) schematic
 - (b) sensory register
 - (c) short-term
 - (d) long-term
39. You are shown a math problem to solve. As you try to remember the formula involved, which memory system is being searched?
- (a) sensory register
 - (b) long-term
 - (c) short-term
 - (d) schematic
40. Two students are shown a variety of tools in a woodworking class. Student A is asked to name the tools and Student B to indicate several possible uses of each tool. Which would be predicted by the levels-of-processing theory?
- (a) Student A would later remember more of the tools than Student B.
 - (b) Student B would later remember more of the tools than Student A.
 - (c) Neither student would have an advantage in later remembering the tools.
 - (d) Student A would have better long-term memory and Student B better short-term memory.

41. Carol majored in French when she was in college four years ago. Now she is taking a Spanish class and finds that she frequently uses French pronunciations for Spanish words. This is an example of
- (a) episodic memory.
 - (b) retroactive interference.
 - (c) proactive interference.
 - (d) semantic memory.
42. Jonas says "I know that I saw that word on the right side of the page and that it begins with 'W'. I just can't remember it." He is directly experiencing
- (a) proactive interference.
 - (b) reconstruction.
 - (c) retroactive inhibition.
 - (d) the tip-of-the-tongue phenomenon.
43. You are asked to learn the 50 U.S. states, so you divide the country into geographic areas and set about your task. You are more likely to succeed than someone who begins to learn the states at random because your system
- (a) capitalizes on the serial position effect by fragmenting the task.
 - (b) minimizes proactive interference.
 - (c) helps you encode the names of states at the time of recall.
 - (d) employs cues to organize your transfer from short-term memory.
44. The first step in peg-type mnemonics is to
- (a) organize the new material into meaningful patterns.
 - (b) memorize a standard list of places or words.
 - (c) associate each element of the new material with a place or thing.
 - (d) visualize each element of the new material.
45. Which of the following is NOT a component of metacognition?
- (a) awareness of resources
 - (b) awareness of strategies
 - (c) knowledge of facts concerning a subject
 - (d) knowledge of how to perform a strategy

46. The technique used to develop new behaviors by breaking them down into small steps and reinforcing attempts at each step until it get progressively closer to the behavior is
- (a) chunking.
 - (b) shaping.
 - (c) metacognition.
 - (d) discrimination.
47. A contingency contract has all of the following good effects EXCEPT
- (a) it involves the student in the learning process.
 - (b) it gives the student some control over their behavior.
 - (c) it ensures that a student will set appropriate goals for their learning.
 - (d) it allows a student to know their standing in a class and ensures that the teacher cannot bias this standing.
48. In order to process information, we must _____ information in the sensory register.
- (a) attend to
 - (b) analyze
 - (c) ignore
 - (d) we don't have to do anything it occurs automatically
49. The reason that two people may perceive very different patterns when looking at the same picture in a museum is most likely the function of
- (a) art appreciation.
 - (b) incomplete sensory processing.
 - (c) inappropriate sensory processing.
 - (d) context based on experiences.

50. According to the information processing view all of the following are reasons we might not make a response even though we have learned EXCEPT
- (a) we cannot retrieve what we have learned.
 - (b) long-term memory is not permanent.
 - (c) we lack the motivation for responding.
 - (d) there is some type of response interference.

KEY

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|---------|---------|
| 1. (b) | 38. (c) |
| 2. (b) | 39. (b) |
| 3. (c) | 40. (b) |
| 4. (c) | 41. (c) |
| 5. (c) | 42. (d) |
| 6. (a) | 43. (a) |
| 7. (b) | 44. (b) |
| 8. (b) | 45. (c) |
| 9. (d) | 46. (b) |
| 10. (a) | 47. (c) |
| 11. (b) | 48. (a) |
| 12. (d) | 49. (d) |
| 13. (c) | 50. (b) |
| 14. (b) | |
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| 25. (c) | |
| 26. (b) | |
| 27. (c) | |
| 28. (b) | |
| 29. (b) | |
| 30. (a) | |
| 31. (c) | |
| 32. (d) | |
| 33. (c) | |
| 34. (b) | |
| 35. (a) | |
| 36. (b) | |
| 37. (c) | |

PSY 366 -- Final Exam

1. Lashon is very interested in Mrs. Willy's lesson right now, but he is unlikely to remain so for very long. The type of motivation being evidenced is
 - (a) state.
 - (b) extrinsic.
 - (c) intrinsic.
 - (d) trait.

2. Mrs. Riley tells the class, "If we have a good lesson on fractions, I will credit each of you with a bonus point." She is trying to stimulate _____ motivation.
 - (a) state
 - (b) extrinsic
 - (c) intrinsic
 - (d) trait

3. People who have a natural, long-term interest in different activities are high in _____ motivation.
 - (a) state
 - (b) extrinsic
 - (c) intrinsic
 - (d) trait

4. According to the behavioral view, students are primarily motivated by
 - (a) an inherent need to understand what they are learning.
 - (b) a desire to gain secondary reinforcers.
 - (c) the desire to feel accomplished.
 - (d) social recognition and status.

5. The cognitive view of learning assumes that people are motivated by
 - (a) consequences of external events.
 - (b) physical conditions.
 - (c) expectancies and values.
 - (d) interpretations of external events.

6. In most humanistic theories, motivation is based on
 - (a) desires.
 - (b) social status.
 - (c) needs.
 - (d) rewards.

7. Which of the following pairs a theoretical orientation to motivation with an appropriate component or descriptor of that orientation?
 - (a) behavioral: equilibration
 - (b) humanistic: secondary reinforcement
 - (c) cognitive: self-determination
 - (d) social: self-efficacy

8. Generally speaking, a relatively high level of arousal is
 - (a) debilitating on all tasks.
 - (b) facilitative on all tasks.
 - (c) facilitative on simple tasks, but debilitating on difficult tasks.
 - (d) debilitating on simple tasks, but facilitative on difficult tasks.

9. High anxiety in test-takers shows it is consistently associated with
 - (a) incomplete tests.
 - (b) higher scores.
 - (c) lower scores.
 - (d) faster test completion.

10. Students with performance goals are largely concerned with
- (a) achievement motivation.
 - (b) looking good in front of others.
 - (c) bettering themselves in terms of skill competencies.
 - (d) finishing tasks so that they can seek new challenges.
11. Which of the following exemplifies a learning goal?
- (a) "If I master this material, I can have some free time."
 - (b) "Accomplishing this should make me better prepared for Biology 107."
 - (c) "Jason is really going to be impressed if I can learn this laboratory procedure."
 - (d) "I'm going to go for the third assignment option, so that I can get an 'A'."
12. In Maslow's hierarchy, self-esteem is considered a
- (a) deficiency need.
 - (b) proficiency need.
 - (c) being need.
 - (d) self-actualized need.
13. Which of the following is a correct implication of Maslow's hierarchy for education?
- (a) A student with low self-esteem will probably have little motivation to belong to and be liked by a group.
 - (b) A student who is feeling ill or unsafe may show little interest in academic performance.
 - (c) Failure to satisfy aesthetic needs will prevent a student from having high self-esteem.
 - (d) A student who is frustrated in her search for knowledge may show little interest in her physiological well-being.

14. According to the attribution theory, students who see the causes of their failures as internal and controllable will react to those failures by
- (a) feeling resentful and annoyed.
 - (b) berating themselves for their failure.
 - (c) exhibiting confusion and anxiety.
 - (d) finding strategies to succeed the next time.
15. Alvin says, "I did well because of some lucky guessing." The type of attribution being demonstrated is
- (a) internal-stable.
 - (b) external-stable.
 - (c) internal-unstable.
 - (d) external-unstable.
16. Pat believes that the reason for her success in reading is because she puts so much effort into it. Pat probably has a(n) _____ locus of control.
- (a) external
 - (b) internal
 - (c) stable
 - (d) entity-oriented
17. Josh has an internal locus of control. He is likely to blame poor marks in science on his
- (a) teacher's difficult tests.
 - (b) parents' pressures to succeed.
 - (c) lack of effort.
 - (d) bad luck.
18. Students who demonstrate "learned helplessness" are likely to
- (a) believe that trying harder will improve their results.
 - (b) focus on their failures and not seek help.
 - (c) improve their performance with extra help.
 - (d) find ways to attribute their failures to others.

19. Sally sets very unrealistic goals for herself and is unsure about her own abilities. Our text would likely label Sally as
- (a) failure-avoiding.
 - (b) mastery-oriented.
 - (c) failure-accepting.
 - (d) mastery-elusive.
20. Under which goal structure does one student's success increase the chances for another's failure?
- (a) competitive
 - (b) authoritative
 - (c) individualistic
 - (d) cooperative
21. Under a cooperative goal structure
- (a) one student's success increases the chances of another's success.
 - (b) one student's failure has no bearing on another student's chances for success or failure.
 - (c) If one student fails, all must fail.
 - (d) one student's success decreases the chances for another's success.
22. The students in Mrs. Smith's class know that they will reach their goal only if the other students also reach that goal. Their belief is typical of which goal structure?
- (a) cooperative
 - (b) competitive
 - (c) individualistic
 - (d) exclusive
23. Individual learning expectation refers to
- (a) a students' perceptions of their own abilities in a particular course.
 - (b) a base performance score used for determining degree of improvement.
 - (c) level of aspiration.
 - (d) teachers' biases regarding student ability levels.

24. What component of STAD is designed to give each team member an equal opportunity to contribute to the team points?
- (a) Teams are composed of like-ability members.
 - (b) Points are based on improvement rather than absolute score.
 - (c) Students take the quizzes in groups.
 - (d) Any student who passes earns the maximum number of points.
25. Which of the following is a feature of mastery learning?
- (a) group rewards
 - (b) individualized learning contracts
 - (c) self-pacing
 - (d) all of the above
26. When a teacher's expectations lead to a student achievement that conforms to those expectations, the effect is called
- (a) cooperative goal structuring.
 - (b) personal causation.
 - (c) proactive feedback.
 - (d) self-fulfilling prophecy.
27. Which of the following is true about the sustaining expectation effect?
- (a) Real improvement is not recognized, resulting in the continuation of low expectancies.
 - (b) The students true abilities are initially misdiagnosed, resulting in inappropriate expectancies being conveyed.
 - (c) Expectancies about a student are communicated from one teacher to another within a school.
 - (d) Students are taught to believe in themselves and their ability to succeed.

28. Joan is seen by her teacher as a high-achieving student. Which of the following is NOT likely to be among the ways in which Joan's teacher will interact with Joan?
- (a) Ask Joan more questions.
 - (b) Allow Joan more time to answer.
 - (c) Ask Joan easier questions.
 - (d) Give Joan more prompts and cues.
29. Mrs. Brown was told by another teacher that Johnny was a "slow student and very disruptive in class." By the third day of school, Johnny had been placed in the lowest reading and math groups and been sent to the principal's office four times. Johnny may indeed be appropriately placed, but he may also be a victim of a/the
- (a) low level of aspiration.
 - (b) self-fulfilling prophecy.
 - (c) fear of failure.
 - (d) poor self-image.
30. Mastery learning represents a method of
- (a) individualized learning.
 - (b) between-class ability grouping.
 - (c) cooperative learning.
 - (d) competitive learning.
31. Classrooms contain many different people with differing values, attitudes and goals. This is why classrooms are said to be
- (a) multidimensional.
 - (b) simultaneous.
 - (c) unpredictable.
 - (d) public.

32. At which level is "maintaining" the management system most important?
- (a) preschool
 - (b) early elementary
 - (c) middle school
 - (d) high school
33. At which level is the direct teaching of classroom rules and procedures most critical to effective classroom management?
- (a) early elementary
 - (b) middle elementary
 - (c) late elementary to middle school
 - (d) high school
34. Another term for "time on task" is
- (a) structured time.
 - (b) engaged time.
 - (c) allocated time.
 - (d) managed time.
35. One of the important goals of classroom management is to expand the number of minutes available for learning. The time for learning is known as _____ time.
- (a) allocated
 - (b) classroom
 - (c) engaged
 - (d) teaching/learning
36. In specifying rules, it is recommended that they
- (a) be written down and posted.
 - (b) be large in number and specific.
 - (c) pertain to study behaviors as well as to class behaviors.
 - (d) all of the above.

37. The essential difference between rules and procedures is that
- (a) rules are do's and don'ts, procedures involve how to do activities.
 - (b) rules concern behaviors, procedures concern cognitive activities.
 - (c) rules are seldom written, procedures are usually written.
 - (d) teachers establish procedures, schools establish rules.
38. Teachers who lose instructional time during the first weeks of school by teaching rules and procedures will likely
- (a) continue to be behind schedule all year.
 - (b) have boredom-based misbehaviors.
 - (c) make up the time later in the year through reduced misbehaviors.
 - (d) be seen as too authoritarian by the students.
39. One aspect of "withitness" is
- (a) being public in making corrections.
 - (b) not ignoring minor infractions.
 - (c) being obvious in your awareness.
 - (d) knowing the students' likes and dislikes.
40. Mark throws his book at Sally, but Mrs. Fox mistakenly reprimands Bethany for the mischief. Mrs. Fox has made a _____ error.
- (a) movement
 - (b) timing
 - (c) target
 - (d) selection
41. Kathy's student teacher works well with small groups, but finds it difficult to keep track of the rest of the class during small group sessions. Kathy should work with her student teacher to develop the skill of
- (a) withitness.
 - (b) movement management.
 - (c) group focus.
 - (d) overlapping.

42. Jeremy doesn't much care for Spanish class. While one student translates from the book, others just sit around getting bored. It seems that Jeremy's Spanish teacher lacks
- (a) withitness.
 - (b) target skills.
 - (c) movement management.
 - (d) group focus.
43. Choral responses are used to establish
- (a) withitness.
 - (b) movement management.
 - (c) overlapping.
 - (d) group focus.
44. In determining who owns a problem, the test question for the teacher is
- (a) "Can I do anything about the problem?"
 - (b) "How long has the problem been in existence?"
 - (c) "Does the problem tangibly affect me and disrupt my role?"
 - (d) "Who is most annoyed by the problem?"
45. Greg was trying to pass Bill a note, but Bill kept his eyes on his own work and thought "Why does Greg do this to me? Mrs. Peeper will spot him for sure. She never misses anything. You'd think she could read minds." Mrs. Peeper could be described as
- (a) exhibiting overlapping.
 - (b) wary.
 - (c) withit.
 - (d) a good movement manager.
46. An adolescent student approaches a teacher and says, "I can't sleep very well at night and worry about all the mess in my life." We would define this as a(n)
- (a) teacher-owned problem.
 - (b) identity crisis.
 - (c) student-owned problem.
 - (d) external-stable crisis.

47. In the above example, the teacher's role should be
- (a) to try to solve the problem for the student.
 - (b) serve as a liaison between the student and her parents.
 - (c) act as counselor and supporter.
 - (d) all of the above.
48. Teachers are using assertive discipline when they
- (a) tell students how their actions affect the teacher's feelings.
 - (b) set clear expectations and follow through on consequences.
 - (c) make condemnations without stating the proper behavior.
 - (d) speak angrily and set harsh punishments.
49. Which of the following descriptors is consistent with an assertive discipline style?
- (a) passive
 - (b) hostile
 - (c) aggressive
 - (d) none of the above
50. Which of the following would be considered an assertive response to a discipline problem?
- (a) "Why do you persist in annoying the class?"
 - (b) "If you do that once more, you'll be punished."
 - (c) "Stop talking and return to your seats."
 - (d) "If you weren't so slow, we could be finished by now."

KEY

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|---------|---------|
| 1. (a) | 38. (c) |
| 2. (b) | 39. (c) |
| 3. (d) | 40. (c) |
| 4. (b) | 41. (d) |
| 5. (d) | 42. (d) |
| 6. (c) | 43. (d) |
| 7. (d) | 44. (c) |
| 8. (c) | 45. (c) |
| 9. (c) | 46. (c) |
| 10. (b) | 47. (c) |
| 11. (b) | 48. (b) |
| 12. (a) | 49. (d) |
| 13. (b) | 50. (c) |
| 14. (d) | |
| 15. (c) | |
| 16. (b) | |
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| 25. (c) | |
| 26. (d) | |
| 27. (a) | |
| 28. (c) | |
| 29. (b) | |
| 30. (a) | |
| 31. (a) | |
| 32. (b) | |
| 33. (a) | |
| 34. (b) | |
| 35. (a) | |
| 36. (a) | |